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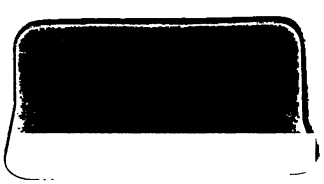

EUSTON SQUARE STATION.

THE RAIL,

ITS

ORIGIN AND PROGRESS:

WITH

ILLUSTRATIVE ANECDOTES AND ENGRAVINGS.

BIBLIOTHECA BODLEIANA

145.

BY

PETER PROGRESS THE YOUNGER.

LONDON:

R. YORKE CLARKE AND CO.,

SUCCESSORS TO HARVEY AND DARTON,

GRACECHURCH STREET.

MDCCCXLVII.

PREFACE.

THE present age is so emphatically one of Railroads, and the public are so deeply interested in railway progression, that no greater or more *moving* social or commercial question can be well imagined to exist. The publishers, therefore, believe, they are performing an acceptable service in furnishing the general reader with an interesting account of the Rise, Progress, Use and Advantages of "THE RAIL," divested of all scientific verbiage, and rendered interesting and perfectly intelligible to all. A similar treatise is nearly ready on the "Electric Telegraph," comprising an account of the signals and arrangements adopted on all the principal lines This will be followed, directly, by the "Steam Engine," similar in size and price; forming, when complete, a valuable and delightful "Travelling Companion." The work has been edited by men, whose eminence, both literary and professional, will be a sure guarantee for the excellence and correctness of its information.

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TRAM-ROADS AND RAILWAYS.

INTRODUCTION.

Soon shall thy arm, unconquered steam, afar
Drag the slow barge, or drive the rapid car.
Or on wide-waving wings expanded bear,
The flying-chariot through the fields of air.
Fair crews triumphant, leaning from above,
Shall wave their fluttering kerchiefs as they move;
Or warrior bands alarm the gaping crowd,
And armies shrink beneath the shadowy cloud.

DARWIN.

THE main object of the busy age in which we live, seems to be to shorten distance, and to save time. For this purpose, hills are levelled and vallies filled up,

canals dug, rivers deepened, and the steam engine made in a thousand ways to supply the office of human hands. To what extent the means of locomotion will be ultimately carried it is impossible to say: there are limits, no doubt, beyond which even the gigantic power of steam shall never pass, and we have no chance at present of seeing the latter part of the poet's prophecy accomplished. Yet if we look back, through the vista of past years, to no greater distance of time than the memory of many a living man can be carried, we shall find that so great has been the progress of human science, particularly in the case of locomotion, that a sanguine man might almost be pardoned for believing that the poet's fiction may some day be accomplished.

Within seventy years the general mode of conveyance for the carrying trade to Yorkshire and Lancashire, from the West of England and Birmingham, was by the means of pack-horses, while the usual accommodation for travellers was the fly-waggon or the slow coach. Perhaps a retrospective glance at the facilities for travelling possessed by our grandfathers, will enable us the better to appreciate the

advantages or disadvantages of our present system.

It is not an easy matter to discover the time when the first stage coach started for the conveyance of passengers; but, in 1662, it is tolerably well ascertained, there were only six in all the country, but even these six were considered by a wise man of the day, John Crossell of the Charter-House, to be six too many—he objected to them entirely, and endeavoured to write them down. It was said at the time, however, that he was merely the agent of the country gentlemen, who were afraid that if their wives could get easily and cheaply up to London, they might not settle so well afterwards to their domestic duties at home.

Referring to a more recent period, the middle of the seventeenth century, we find it recorded, that in 1742, the Oxford stage coach left London at seven o'clock in the morning, and reached Uxbridge at mid-day. It arrived at High Wycombe at five in the evening, where it rested for the night, and proceeded at the same rate for the seat of learning on the following day; and this, be it remembered, took place on a main road near to

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the metropolis, and consequently in better order than the roads in general. About fifty years ago the Holyhead mail left London at eight at night, and arrived in Shrewsbury between ten and eleven the following night, taking twenty-seven hours to run one hundred and sixty-two miles. This distance, however, before the establishment of Railways, was done without difficulty in sixteen hours and a quarter.

At the time when this rate of travelling was considered all that was required, there was a coach on the road between Shrewsbury and Chester, called the "Shrewsbury and Chester Highflyer." This coach started from Shrewsbury at eight o'clock in the morning, and arrived at Chester at about the same time in the evening, the distance being forty miles. This was a good hard road for wheels, and rather a favourable one for draught. "But how," enquires a writer in the "Quarterly Review" for 1832, "can all these hours be accounted for? Why if a 'commercial gentleman' had a little business at Ellesmere, there was plenty of time for that; if a 'real *gentleman*' wanted to pay a morning visit on

the road, there could be no objection to that. In the pork-pie season, half-an-hour was generally consumed in consuming one of them, for Mr. Williams, the coachman, was a wonderful favourite with the farmers' wives and daughters all along the road.

"The coach dined at Wrexham, for coaches lived well in those days; they now live upon air; and Wrexham church was to be seen—a fine specimen of the florid gothic, and one of the wonders of Wales! Then Wrexham was also famous for its ale; there were no public breweries in those days in Wales; and above all the inn belonged to Sir Watkin. About two hours were allowed for dinner; but 'Billy Williams,' one of the best-tempered fellows on earth, as honest as Aristides, was never particular to half-an-hour or so. 'The coach is ready, gentlemen,' he would say, 'but don't let me disturb you if you wish for another bottle.'"

This was the plan adopted in the good old times, when every affair of life moved on at a quiet, jog-trot pace, not at all adapted to the present mode of carrying on business. Competition of the most eager kind has been for

some years the order of the day, and most certainly it cannot be said that stage coaches stood still. Leaving out of the question the light coaches, which travelled at an extremely rapid rate, we may notice the speed maintained by the mails, which had to travel long distances, before their employment was superseded by Railways. The Edinburgh mail ran four hundred miles in forty hours, stoppages included. This was nearly eleven miles an hour. A coach to Exeter, the "Herald," went over its ground, one hundred and seventy-three miles, in twenty hours, and that in a very uneven country; and the Devonport mail performed its journey, two hundred and twenty-seven miles, in twenty-two hours. This increase of speed was alarming to those who had been accustomed to the old fashioned slow coaches, and the rate at which the new vehicles travelled was considered as a reckless risking of human life. Nevertheless the thing went on, and it began to be whispered, in spite of the merciless ridicule of the "Quarterly Review," that if steam were to be employed on a Railroad, it would even be possible to *attain a speed* of some twenty miles an hour.

In reference to a proposed London and Woolwich Railroad, the "Quarterly" not only backed "old Father Thames against it for any sum," but assured its readers that the people of Woolwich "would as soon suffer themselves to be fired off upon one of the Congreve's *ricochet* rockets as trust themselves to the mercy of such a machine, (a high pressure engine) and going at such a rate (eighteen or twenty miles an hour!)" And the reviewer expresses his trust that "Parliament will, in all Railroads it may sanction, limit the speed to eight or nine miles an hour, which is as great as can be ventured upon with safety!!" The experiment has, however, been tried, and we all know with what success.

THE

ORIGIN AND PROGRESS OF TRAM-ROADS AND RAILWAYS.

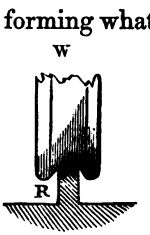
The small amount of friction encountered by a wheel when it rolls over a hard surface was well known to practical mechanics, and it was found that a horse could drag a much heavier load over a hard, smooth, level road, than it could over one with a rough surface. To produce something resembling a road of this description, Tram-roads were constructed. These were almost exclusively confined to the neighbourhood of coal works and mines, and merely consisted of wooden beams laid down along the road.

To make a Railway of this description, the ground is first levelled, or rather formed so as to have a slight inclination towards the port from whence the coals or ore are shipped. Pieces of timber, about six feet long and six inches in thickness, are laid across the road, *at about a foot* or a foot and a half distance

from each other. These are called *sleepers*. Upon these sleepers other pieces of wood called *rails*, four or five inches square, are laid, lengthwise of the road, and four feet distant from each other for the wheels of the waggons to run on. The advantages obtained by a rude wooden railway of this kind, with a declivity of fifty-five feet in a mile, are so great that a single horse will take down waggons containing from twelve to fifteen tons, and bring back the same waggons with four tons in them. The first wooden railway seems to have been employed at Newcastle in 1680, for transporting coals from the pits to the river Tyne, upon which duty, it is stated, even at that time, from four to five hundred carts were employed.

It was soon discovered, however, that one great disadvantage accompanied the employment of wood for the construction of the *rails*—it was liable to rot. Accordingly, instead of wooden rails, flat iron bars were employed. These were nailed to the sleepers in the same manner as the timber rails, and this change in construction was found to answer *well, there* being less friction to overcome on

the iron than on the wooden rails. In other instances stone was employed in the construction of these roads, being sometimes used to form the rails, and in other cases, where iron rails were employed, the sleepers were formed of stone. An application of the railway system was made near Colebrook Dale, which is, perhaps, not generally known. Upon this railway loaded boats are drawn up to a canal, two hundred and twenty feet above the level of the river Severn, and let down into it in a similar manner, by which means twenty-two locks were saved, and the work executed in an expeditious manner. A subsequent improvement was made in the iron rails, by forming what is called an edge rail, thus—



The advantage of this consists in the fact that neither the wheel nor the rail becomes clogged with dirt as was frequently the case when flat rails were employed. The annexed figure is a section of a part of a wheel and rail. W is the wheel with a deep groove formed to receive the rail R. This form of rail was adopted *about 1789,* and since that time there have

been several improvements on the same principle. Dr. James Anderson in his amusing and instructive work, "Recreations in Agriculture," &c., recommended the construction of Railways for the purpose of conveying agricultural produce from one part of a farm to another. But the most interesting suggestion made by this able writer was a plan for a general extension of Railways or Tram-roads throughout the kingdom. The vehicles, of course, were to have been drawn by horses, for the locomotive engine was unknown at the time he wrote on the subject (1801). One portion of his paper is, perhaps, sufficiently curious to be worth quoting even at the present day, showing, as it does, how earnestly he had entered into the plans for carrying out his favourite scheme.

"Suppose," he observed, "a Railway were brought from the wharfs to Bishopgate-street, or any other more commodious part of the town. And supposing all the waggons to be made of one size and form, each capable of containing one ton of sugar, or other goods of similar gravity. Let the body of each of these *waggons* be put upon a frame that rests

upon the two axles of four wheels, calculated to move only upon the Railway, and let each of these waggons be loaded with goods which are to go to the same warehouse or its vicinity. The whole of the waggons being thus loaded, they are moved forward till they come to the end of the road, at which place they should be made to pass under a crane. When a waggon comes under the crane (or, for the sake of expedition, a crane may be provided for each waggon,) let it be lifted up from the crane and transferred at once to another similar frame, resting on wheels, formed for going along the streets, to which is attached a pair of shafts for a horse to move in. The carter has then no more to do than to go off with his load to the street and house to which it is directed; where, having unloaded it, he may return directly with the empty waggon, where it can be lifted from the wheels by another crane, further on than the unloading crane, and still above the Railway, on which it can remain suspended until an empty set of rail wheels shall come to receive it; these return waggons, whether full or empty, are then lowered down on the rail wheels *and taken back to* the wharfs, and so on."

"Nothing surely," he continues, "can be more easy, or more simple, than this arrangement; and if the Railway were carried forward along the skirts of the town, in a direction that should be found convenient, until it reached the Paddington canal, having delivering cranes as above described at every principal street it passed, goods might thus be distributed all over the town with the utmost convenience and economy, or sent forward by canal to distant places; and goods coming from the canal could, in like manner, be distributed to the town, or taken to the wharfs, as circumstances might require." . . . . . "On the same plan it is certainly very practicable to carry roads of a similar description from London to Bath." The advantages likely to result from his plan he thus notices:—"The convenience of such roads would be very great from the circumstance of having separate moveable waggons as above stated. One separate waggon or more could be thus left at any place on the road, and others taken up in their stead, like passengers in a stage coach, without disturbing the others. Farmers, too, near these roads, could thus send *their corn* by that means to any distance they

might find convenient, and get back in return manures, or goods of any sort they might want, with perfect safety; each person having his own waggon, if he so chose it, covered and locked, so as to be opened only by those who have the key." It is worth remarking here that the Regent's canal was constructed for the same purpose as the projected Railway of the learned doctor, as a means of conveying goods from the docks to the Paddington canal, and that a bill was lately laid before Parliament to enable a company to fill up the canal and construct a Railway in its place. The doctor's plans, however, were not carried out to the extent he anticipated. But coals are brought from Kilburn to Derby at the present day by canal in coal bodies of this description, and being placed on wheels they form ordinary one horse carts. Tram-roads or Railways nevertheless began to spread over the face of the country, more particularly in the northern districts of the island; but no one contemplated their employment as a substitute for stage coaches until about the time the locomotive engine was invented. The scheme for extensive *Railways, the* motive power being horses, was

never carried into effect, although in 1830, when the London and Birmingham Railway was projected, it was in the first instance proposed to employ animal power, and the vehicles were warranted to go at the rate of eight miles an hour. Previously, however, on the 27th September 1825, a short public Railway, sanctioned by Act of Parliament, was opened, between Stockton and Darlington in the county of Durham, a distance of about eleven miles. But at an earlier period still, in 1804, a locomotive engine, patented in 1802 by Messrs. Vivian and Trevethick, was successfully applied on a Railroad at Merthyr Tydvil for the conveyance of coals.

We must not omit to notice, however, the efforts of Mr. Thomas Gray, who is still living. Like Dr. Anderson he advocated a general system of iron Railroads, and, in 1820, he published a pamphlet on the subject, containing numerous engravings, representing the proposed form of the carriages, trucks, &c. It has also been shown that Mr. Gray was the original projector of the Liverpool and Manchester line, as the preliminary experiment for a general *system of* Railways throughout England.

At the same time he published a map of a system of direct trunk lines, which, after fifteen years experience and a large expenditure of capital, are now found to be essential parts of the present arrangements. When he first published his practical plan in 1820, it seems he was considered a visionary; and notwithstanding his persevering efforts, and the memorials he addressed to influential men, he was utterly neglected; and it was not until a pamphlet was published in 1845, written by Thomas Wilson, Esquire, of Brussells, that the present generation appeared to be aware of what he had done, for his name even appears never to have been mentioned in any work on Railways.

In comparing the merits of Gray with those of Dr. Anderson, we must consider how much the means of locomotion had improved since the day when the doctor wrote on the subject; and, therefore, we must naturally have expected that the plans of the later writer would be necessarily more comprehensive.

Before Gray published his work he placed it in Mr. Wilson's hand, and addressing him at the same time with peculiar solemnity of countenance, " Here," he said " is the main-spring

of the civilization of the world: all distances shall disappear; people will come here from all parts of the continent without danger and without fatigue; distances will be reduced one half; companies will be formed; immense capital paid and invested; the system shall extend over all countries; emperors, kings, and governors, will be its defenders; and this discovery will be put on a par with that of printing." Such were the prophetic words he employed on the occasion. On the title page of his work he had written, "Observations on a Railroad for the whole of Europe."

"The project," continues Mr. Wilson, "was so great, and at the moment appeared to me to be so chimerical, that I could not help the exclamation, 'the poor man is insane!' Yet in this year, 1845, we live to see it already carried out to an immense extent; and within five years more, supposing one half only of the projected lines to be executed, we shall have one almost uninterrupted line of railway communication from the Pillars of Hercules to the Moskwa, to say nothing of the numerous lateral and diverging lines and branches in the various

states of continental Europe and the railway lines of Great Britain."

Across the Atlantic we have the United States with their thousands of miles of Railroad made, and one gigantic project, proposed at this moment, for the construction of a Railroad from the western shores of Lake Erie to the navigable part of the Columbia river in the Oregon territory, a distance of 2,750 miles, and which would directly connect the Atlantic shores of the Union with the great Pacific.

Cuba has its Railroad, and is trying for more. Jamaica will scarcely lag behind; and the two isthmuses of Panama and Suez seem, at length, on the eve of being crossed with Railways, and far-off India is laying down lines for survey, resolved to draw closer the links of communication between the distant points of her extended regions.

The notice thus taken of Gray's services in the cause of Railways has excited much attention, and a number of influential men are at the present moment endeavouring to raise a fund by public subscription to recompense him for his past exertions.

THE FIRST RAILWAY, AND ITS CONSTRUCTION.

The Liverpool and Manchester was the first Railway of any magnitude that opened its line for the carriage of passengers. The first prospectus of this company was dated October 29, 1824, and the work was completed and opened to the public on Wednesday the 15th September 1830. On this occasion, as early as seven o'clock in the morning, the people of Liverpool were seen flocking in crowds to the tunnel at the commencement of the Railway, to secure good places for viewing the procession. The Duke of Wellington and other men of note were present, and the procession left Liverpool at twenty minutes before eleven o'clock, drawn by eight locomotive engines in the following order:—the Northumbrian, with the directors and numerous distinguished visitors, including the Duke of Wellington; the Phœnix, with a green flag; the North Star, *yellow;* the Rocket, light blue; the Dart,

purple; the Comet, deep red; the Arrow, pink; and the Meteor, with a brown flag. The Northumbrian drew three carriages; the first containing the band, the second the Duke of Wellington and others; and the third the directors of the Railway. The Phœnix and North Star drew five carriages; the Rocket three; and the Dart, Comet, Arrow, and Meteor, each four. The number of passengers conveyed on this occasion was 772. The speed maintained was not more than from fifteen to sixteen miles an hour; but that rate was intentional, to allow the company to inspect the works as they passed along. The first trial of the undertaking was completely successful, and everything would have gone off well had it not been for a melancholy accident that happened to the distinguished statesman, Mr. Huskisson.

The accident appears to have arisen from the irresolution of the unfortunate gentleman. He was standing close to the carriage that conveyed the Duke of Wellington; for the train having stopped at Park-side Bridge, several of the passengers, against the advice of the company's servants, got out of the carriages, among

them was Mr. Huskisson. If he had stood close up to the carriage he was near, another train might have passed without injuring him; but, unfortunately, the moment before the Rocket passed, he caught hold of the open door of the Ducal Car, which was struck by the passing engine, and being thrown on the line of rails upon which the Rocket was moving, his right leg came in contact with the wheel of the engine and was completely crushed; so serious, indeed, were the injuries he received, that death put an end to the patient's sufferings a few hours after the accident.

The establishment of this Railway soon exhibited the advantages to be derived by employing this mode of transport; so soon, indeed, was this manifest that eighteen months after the completion of the work it had carried 700,000 persons, being an average of 1,070 per day. Previous to the establishment of the Railway there were twenty-two regular and seven occasional coaches, which could only carry, when full, 688 persons per day: the time occupied by the coach was four hours, and by the rail one hour and a half. The

cheaper rate at which goods and passengers could be conveyed was another advantage over the conveyance by canal or coach, and the manufacturers of Manchester alone, it is said, saved more than £20,000 per year, merely in the carriage of cotton. Before Railways were carried to any great extent heavy goods were conveyed from one end of the kingdom to the other by means of canals. The carriage was at a lower rate than when goods were sent by the road; but slow as our "fly waggons," as they are or once were called in some parts of the country, used to be, they were immensely more expeditious than boats on a canal, especially where many locks had to be passed through. The passage from Liverpool to London by canal, some years back, occupying nearly a fortnight.

But there are other benefits arising from this rapid means of communication besides the convenience and cheapness of transit. The frequent communication between the inhabitants of different parts of the kingdom, is clearly a means by which the arts of civilization may, nay must, be more universally propagated; the quick and cheap conveyance of

produce will induce the farmer to take more land into cultivation; and the reduction in the poor rates, owing to the large amount paid by the railway companies, is another advantage to the inhabitants of rural districts, in addition to the increased value of land.

If, on the other hand, we look to those who dwell in our thronged cities, what benefits do we not perceive they might derive from the more frequent employment of Railways. Much has been lately done and projected to improve the sanatory condition of the people; but too little has been thought of the great assistance that might be rendered to this cause by the agency of the Railroad. What vast numbers of our crowded population might be removed from the contaminated atmosphere, both moral and physical, of great cities, by the establishment of small villages by the side of the Railroad, within the distance of ten miles from town! and, while the workman could be brought to his work in half-an-hour, and at an extremely low charge, his wife and family would be benefitted by the greater pureness of the country air and the superior cleanliness of their dwelling.

Great, however, as the advantages of Railways are, it was not without enormous pecuniary cost, and, in many cases, fierce opposition, that they were carried into effect. We have already stated that the first prospectus of the Liverpool and Manchester Railway was issued in 1824. At the beginning of 1825, a bill was brought into Parliament to authorise the establishment of a company, but on account of the opposition it met with, chiefly from the canal proprietors, it was withdrawn. In 1826, another bill was introduced and carried; and in June of the same year, the work was begun. A short sketch of the operations on this Railway will give the reader some notion of the difficulties that lie in the way of undertakings of this nature.

The distance between Liverpool and Manchester by Railway is about thirty-one miles, and the Docks at Liverpool are sixty-six feet below the level of Manchester; but at Edge Hill, close to Manchester, the ground is one hundred and sixty-nine feet above the Docks. Now it was necessary to render this ground as nearly level as possible, and this *could only be* done by lowering the hill, or

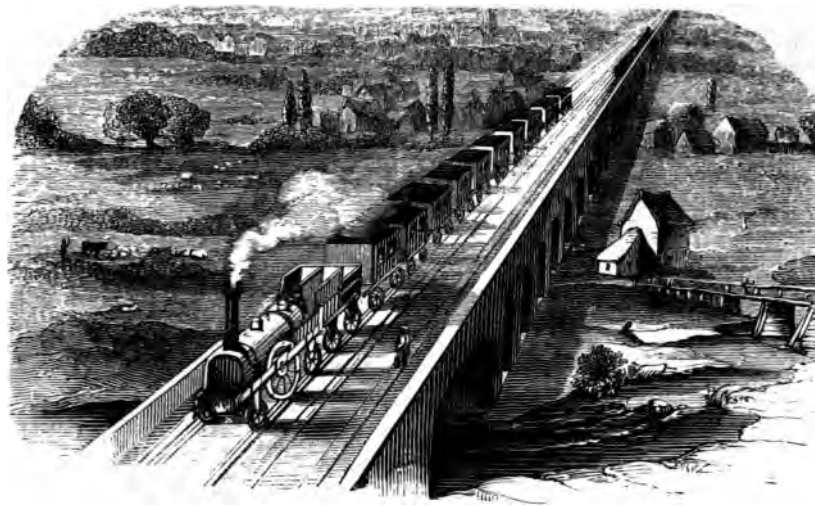
by excavating a tunnel. The latter plan was resorted to at Liverpool, at the back of which the ground suddenly rises, and to avoid interfering with the town itself, it was determined to cut a tunnel under it. This tunnel, which, in some places, was carried through solid rock, is 5,910 feet in length. Among other operations sixty-three bridges had to be built, and the cuttings amounted to about 720,000,000 cubic yards, while the embankments were 277,000 cubic yards, which, together with the tunnelling and other works, presented difficulties none but British engineers would have undertaken, and for which none but British capitalists would have risked the cost.

When the works were begun there was one peculiar natural obstacle to be overcome. The road was intended to pass over Chat Moss, a piece of boggy land, five miles and a half in width, and it was very much doubted at the time whether this road could be formed, for in some places, the bog was from thirty to thirty-five feet in depth, and so soft that an iron rod would sink through it by its own gravity; and yet through skill and enterprise,

in less than three years afterwards, a locomotive engine and a heavy train of carriages passed over it. That part of the Moss which presented the greatest difficulty was about half a mile on its eastern border, where an embankment had to be formed twenty feet above the natural level. The weight of this mass of earth pressed down the original surface, and many thousand of cubic yards of earth disappeared in the half fluid bog, before anything approaching to the intended level could be obtained.

A viaduct or elevated roadway across Sankey Valley was another difficult task. For the security of the work, it was necessary to drive two hundred piles, varying from twenty to thirty feet in length, into the foundation of each of the ten piers. Thus, in all, two thousand piles had to be driven, and all those who have seen the pile driving engine at work and noticed the small progress made at each blow from the ponderous monkey, will have some idea of the labour and tedious nature of the task.

The tunnel we have already noticed, was *another laborious* undertaking; it was begun



VIADUCT.

in 1827, and carried forward night and day with untiring perseverance. For the sake of greater expedition it was constructed in seven or eight different lengths, each communicating with the surface by means of shafts through which the substance excavated was drawn up.

At length, on the 9th of June 1828, it was reported to the directors that the last joining between the several lengths had been effected. To add to the difficulties of this undertaking, the excavators, on several occasions, refused to work, for in some cases there was much danger to be dreaded. At one part of the working, for instance, for want of sufficient props, a large mass of loose, moist earth and sand fell in; the water was, in other instances, equally troublesome, if not quite as dangerous. The breadth of this tunnel is twenty-two feet, the side walls being five feet high, with a semi-circular arch of eleven feet radius, making the height sixteen feet. As before stated, it is one thousand nine hundred and seventy yards in length, and rises one hundred and twenty-three feet, on an inclination of one in forty-eight. This tunnel throughout its whole length is lighted with *gas,* and the sides and roof are whitewashed.

This, however, is an exception to the general rule, and some of the tunnels on the Railways of later construction, are as dark and dismal as any lover of the horrible could wish.

ACCIDENTS, TRAFFIC, EXPENSES.

What faith must not a traveller by Railway have in the skill and care of the engineer when he trusts himself under his guidance, and is hurled along at the rate, perhaps, of forty miles an hour through one of these subterranean tunnels. When mid-way, perhaps, another train is coming in the opposite direction, and you hear the continual beating of the piston and the shrill whistle of the engine as with warning voice it tells of its approach, and then with a rush, a clank, and a crash, the two trains pass each other,—and yet so accustomed are we to these perils that nobody seems to think of the danger. After all, however, the number of accidents, in proportion to the number of passengers carried, and the number of miles travelled, was ten times as many in the case of coaches as in that of Railways. By a parliamentary return, it appears that the number of accidents in 1842, on all the

Railways in England and Scotland, was as follows:—

	Killed.	Injured.
Accidents of a public nature, attended with personal injury to the public	5 ..	14
Accidents attended with personal injury to individuals, owing to their own inadvertence or misconduct	26 ..	22
Accidents attended with personal injury to servants of the company, under circumstances not involving public danger	42 ..	35
	73 ..	71

In 1844, the number of accidents reported in England, Scotland, and Ireland, were 84 killed and 102 injured; but then it is to be considered that many new lines had been opened during the two previous years, and the traffic had greatly increased. Out of the above number there were 6 passengers killed, and 40 injured; 20 of the latter were injured on the London and Croydon Railway, in consequence of the signal light having gone out.

The following statement of the passenger traffic for 1842, will give some idea of the vast *number of* passengers conveyed by Railway,

and of the miles travelled. The number of passengers carried during that year amounted to 24,650,000, conveyed on the average thirteen and a half miles each. Of these, 24,068,000 travelled on the seventeen hundred and fifty miles of passenger Railways, properly so called, giving an average of 13,700 passengers per mile; or if we leave out of the account the three short metropolitan lines, the Blackwall, Greenwich, and Croydon, upon which alone 4,030,837 of the whole 24,068,000 passengers were conveyed, (of this number the Blackwall Railway carried 2,153,723, the Greenwich Railway 1,518,587, and the London and Croydon 358,527 passengers,) it gives for the general traffic of the kingdom an average of 11,800 passengers per mile, per annum, carried on the average, fifteen miles each. The average gross receipts, per mile per year, on one thousand seven hundred and fifty miles of Railway is £2,570, of which £1,740 arose from passengers, £554 from merchandise and minerals, £98 from cattle, horses, and carriages, and £178 from parcels, mails, and other sources. The gross receipts for passengers during the year was £3,082,760; for merchandise and minerals,

£1,072,313; cattle, horses, &c., £180,461; parcels, mails, &c., 306,063, making a grand total of £4,781,067. However, 1842 was a year of great depression, and there is no doubt that the money received during the last year (1846), was at least 15 or 20 per cent. more. As to the weight of merchandise and minerals, it was, in 1842, from 5,000,000 to 6,000,000 tons. The number per cent. of first class passengers was 18·4; second class, 46·0; and third class, 35·6; and the average rate of travelling on the principal Railways was at least twenty-four miles per hour.

OBJECTIONS TO RAILWAYS.

These few details of the amount of traffic and receipts, are clear evidence of the beneficial effects of Railways; and yet objections of various kinds, some of them of the most frivolous nature, were put forward to obstruct their progress. Vested interests would be improperly interfered with, was the cry of a numerous body, it being forgotten that the good of the public in general ought to be the first rule by which the legislator should be guided; the breed of horses would be destroyed; coachmen, guards, postboys, and ostlers, were to be annihilated as a race; and society convulsed from one extremity of the country to the other. With respect to the coach interest, what has been the consequence? Many of the long stages have been put down, but the numerous branch coaches, omnibuses, flys, cabs, &c., &c., which have been established, show that the demand for horse vehicles and drivers has increased to an enormous extent.

One objection of the farmers had more force; they dreaded the introduction of so rude a class of men as the "navvies" into their localities; but the evil was to be only temporary, and after all the "navvies" are not quite so bad as they are represented, as we shall endeavour presently to show. The country gentleman objected to his privacy being interfered with, or his land divided by the intersection of a Railway. One old lady of our acquaintance was loud in her lamentations; she had for many years been in the habit of taking an evening stroll in a meadow near the Thames. As it happened, she herself was really a trespasser, for the land did not belong to her, neither was there a public footpath through the field; nevertheless she considered her vested rights interfered with.

This class of objectors confined their opposition to words, or petitions to Parliament, but there was another class who took more active measures to prevent the formation of Railways —they not only opposed them in Parliament, but also in the open air, and that by physical force. These opponents endeavoured to crush *the "evil,"* as they called it, in the egg; they

knew that no Railway could be carried into effect, nor could a bill be even introduced into Parliament, until the ground over which it had to pass had been surveyed, and the levels carefully taken. Accordingly, in many instances, the surveyors were opposed by large parties of rough countrymen, and driven from the ground, with their instruments, if not their heads, broken. And eventually many of the nobility and landowners succeeded in mulcting the companies of large amounts for alleged damages. Some of these claims have been ridiculous enough. One man claimed compensation because his horses, when in the stable, were frightened by the noise of the trains and kicked each other; and a farmer in Norfolk sent in a claim because his cows would not give so much milk.

The opposition, however, was not always of this violent character. A projected line of Railway in the north of England was intended to pass through a portion of a gentleman's estate, and strict orders had been left to prevent the engineers taking the levels. The steward, who it appears was a pleasant fellow enough, although he determined to carry out

the owner's intentions to the fullest extent, considered that he might do so without a personal rencontre with the men he looked upon as trespassers, he thought he might combine the *suaviter in modo* with the *fortiter in re.* He told them when they applied for leave to go over the ground, that his orders were to prevent their setting a foot upon it, and that he should use every means in his power to frustrate their plans. The engineers on their side seemed to be equally unwilling to resort to main force, and for several days, by the activity of the rich man's deputy, some object or other was placed between the surveyor's theodolite and the marked staff, erected at a distance by his assistant. In vain he shifted the instrument, the steward was on the alert, and fresh obstacles were placed in his way: in one instance, a lofty scaffolding was erected to prevent his taking a level.

Finding himself thus met at all points, the surveyor resorted to cunning to obtain his end; he called upon the steward, told him he found his case was hopeless, and that he had been ordered to abstain from all further attempts *until the* permission of the owner could be

obtained, which it was still hoped might be effected. In the meantime he should feel very glad to drown all animosities, if any existed, over a bottle of wine, of which he invited him to partake at the inn at which he had put up. The steward accepted the offer, and heartily tired of the trouble he had been put to, ordered the scaffolding he had erected to be removed; and having seen this done, he proceeded to his appointment with the surveyor, whom he found in the act of locking the last of the boxes containing his apparatus. Being welcomed by the latter, he seated himself and did good justice to the liquor placed before him. At the same time, in the fullness of his heart, he congratulated himself upon the defeat of the Londonner, who on his side seemed, most unaccountably, equally satisfied, and the conversation became gradually more and more cheerful.

At length, in the midst of their mirth, a companion of the Londoner entered. He had a theodolite in his hand, and while he quietly asked his companion for the key, and replaced the instrument in the empty case, he informed his fellow Londoner that the observation he had taken proved the gradient was equal to one in

twenty, and "that," he observed, "completes our line, and we may bid this worthy gentleman good day, as we must be in Birmingham by the evening. I wish him better success in his next plot against a Cockney." Even some large towns objected to the passage of a Railway in their neighbourhood. Leamington, for instance; but soon after the opening of the London and Birmingham Railway, which had been intended to run close to their town, the inhabitants applied to Parliament to obtain a bill for a branch from the great trunk line to Leamington. A feeling of the same kind prevailed at Northampton also, and at Norwich. At the latter place, the complaint was that the Railway came too near to the city, and now the inhabitants have discovered that it is too far off.

As we have already observed, one of the great impediments in the construction of a Railway, is the enormous outlay requisite for the purpose. The expenses come under several distinct heads, and the following Table will give some idea of their amount:—

PARLIAMENTARY EXPENSES.

	Per Mile.
London and Birmingham, and London and South Western	£ 650 .. ..
Great Western, and Manchester, and Leeds	1,000 .. ..
London and Brighton	3,000 .. ..

LAW CHARGES—ENGINEERING—DIRECTION.

London and South Western	900 .. ..
Grand Junction	1,200 .. ..
Birmingham	1,500 .. ..
Manchester and Leeds	1,600 .. ..
Brighton	1,800 .. ..
Great Western	2,500 .. ..

LAND AND COMPENSATION.

Newcastle and Carlisle	2,200 .. ..
Grand Junction	3,000 .. ..
South Western	4,000 .. ..
Manchester and Leeds	6,150 .. ..
Birmingham and Great Western	6,300 .. ..
Brighton	8,000 .. ..

RAILWAY WORKS AND STATIONS.

Newcastle and Carlisle	12,000 .. ..
Grand Junction	15,000 .. ..
South Western	18,450 .. ..
Birmingham	38,280 .. ..
Great Western	40,000 .. ..
Manchester and Leeds	41,400 .. ..

CARRYING ESTABLISHMENT.	Per Mile.
Newcastle and Carlisle	1,300 .. ..
Grand Junction	2,000 .. ..
South Western	2,350 .. ..
Birmingham and Brighton	3,000 .. ..
Manchester and Leeds	3,600 .. ..
Great Western	4,800 .. ..

In the case of the continental Railways, the first three classes of expenses have not been so great. The "law charges," &c., on the Belgian, were £430 a mile; on the Paris and Rouen, £800. The "Land and Compensation," Paris and Rouen, £2,300; Belgian, £2,750. In "Railway Works and Stations," Belgian £10,600 per mile; Paris and Rouen, £17,000. In the "Carrying Establishments," Belgian, £2,350; and Paris and Rouen, £2,400 per mile.

If we now refer to the cost of American Railways, we find that, in 1840, there were 176 lines, intended to extend over 9,321½ miles, of which, at that period, 3,500 miles were completed, at an average cost per mile of £4,800. The traffic upon 3,500 miles of the American Railways was, at the end of 1839, alone equivalent to 35,000 passengers carried through;

that upon 2,000 miles of English Railways equal to about 155,000 passengers carried through, and the traffic on the Belgian Railways in length 3,434 miles, equal about 260,000 passengers also carried through their whole length.

The total cost of some of the principal Railways was as follows :

Great Western (including the Branches to Exeter and Cheltenham	£ 6,651,000
London and Birmingham	5,953,800
North Midland	3,340,000
Manchester and Leeds	3,104,000
Eastern Counties	2,737,000
London and Brighton	2,657,000
London and South Western....	2,583,700
South Eastern	2,530,000
Liverpool and Manchester	1,514,200

And the gross total of the cost of the construction of thirty-six Railways, was £54,823,700. Since this time it has been ascertained that, from the 1st of January 1826, to the 1st of January 1844, one hundred and twenty-six Railway companies obtained Acts of Parliament, enabling them to raise in the aggregate the enormous sum of £79,026,317.

its occupants, three gentlemen, alighted and rushed down the passage towards the office door, each bearing a plan of Brobdignagian dimensions. On reaching the door and finding it closed, the countenances of all drooped; but one of them, more valorous than the rest, and prompted by the bye-standers, gave a loud pull at the bell. It was answered by the Inspector of Police on duty, who informed the ringer it was now too late, and that his plans could not be received. The agents did not wait for the conclusion of the communication, but took advantage of the doors being open and threw in their papers, which broke the passage lamp in the fall. They were thrown back into the street, and when the door was again opened, in went the plans again, but only to meet with a similar fate. As it was, six hundred plans were actually deposited. And what, the reader may ask, were the liabilities the projectors incurred for the new lines, supposing they were to be carried out? Why five hundred and sixty-six millions, nineteen thousand and six pounds sterling! and the money required to be deposited in the first instance *was fifty-nine* millions, one hundred and

thirty-six thousand, and three hundred pounds sterling.

Our facetious contemporary, "Punch," could not allow so favourable an opportunity for a joke to pass unnoticed. Accordingly, after describing the hair-breadth escapes of two rival agents on their journey to town by the Railway to deposit their plans at the office of the Board of Trade, and their luckless deposit in the mire, on account of the engine running off the rails, he proceeds:—

And there we stuck knee deep in mire,
We stormed, we swore, we stirred the fire;
But there we were in our despair,
And neither seemed a fig to care,
About us or our plans.
With hunger and with bruises faint—
'Twould raise the dander of a saint,
Much less a mortal man's!
With grim resolve we sat us down,
(For we were thirty miles from town,)
In hopeless certainty of mind—
Even supposing we got there—
The Board of Trade shut up to find;
Oh how we both did swear!
When sudden on the neighbouring road,
A yellow with four posters showed:
Ours—ours that chaise must be!
We rush upon the frightened boys,
We knock them off, and, joy of joys!
Spring each to saddle tree.

Ply, ply the whip, nor spare the spur,
Along the Great North Road we skirr,
The clocks are striking ten!
'Tis thirty miles in two short hours:
But in a holy cause like ours,
Agents are more than men!
So on we go, with plunge and bound,
Our wills are good, their wind is sound—
We'll save our distance still.
But, ah! despite our desperate pluck,
Three quarters past eleven has struck,
As we gain Highgate Hill!
The leaders snort, the wheelers reel,
And past the Peacock as we wheel,
Their breath comes short and thick;
A fall! the leader's wind is broke!
A cab! a cab! 'tis past a joke!
"This if you do the trick."
I waved a flimsy in my hand.
On through Fleet-street, along the Strand,
There's time the change to nick.
'Tis done—we've won, we've reached Whitehall!
But hark what sounds my ear appal!
It is the Horse Guards' clock:
'Tis striking twelve—the hour is past:
Oh heavy fate! sold, sold at last!
At twelve the gates they lock!
And we are left outside the door,
The standing orders to deplore.

THE "NAVVIES."

Our account of Railways would be incomplete without noticing the men by whose labour they are constructed. We have talked of millions of pounds sterling raised for the purpose of carrying out these gigantic projects; but of what avail would these sums be without the labour of the "Navvies?" and where will you find labourers equal to them, except in these islands? This description of men began to form a distinct class at the time, when so much attention was paid to the extension of inland navigation at the latter end of the last century, and hence the term "Navvy." At the present day, however, they are more frequently known by the more appropriate name of Excavators.

"The original Navvy," observes a writer in the "Daily News," "has no home, and the immense demand for his services, occasioned by the rapid extension of the railway system,

has caused the ranks of these men to be recruited from all quarters, and the peculiarities of the 'Navvy' have thus, to a considerable extent, been toned down to the level of ordinary labourers. The 'Navvy' is, from his avocation, stronger than the average of working men; his wages are higher; he has broken loose from local ties, or the influence of a permanent residence, and he has become one of a band similarly circumstanced with himself. The body of 'Navvies' are to him what relations and fellow parishioners are to other labourers—what the men of the same regiment or shipmates are to the soldier and sailor.

"The agricultural labourer with his ten shillings a-week, affects to look down upon the 'Navvies,' who repay him with scorn and rude practical jokes. The raw recruit into the Excavators' army is subjected to treatment of this description, in which the strong veteran is apt to forget that all are not so thoroughly hardened to excessive toil as himself. The thorough-bred 'Navvy,' is sure of assistance from his brethren wherever he goes—'a share of their supper, a share of their bed.' The *Excavators* scorn parish relief, and seek sup-

port in sickness from benefit clubs, or the charity of their fellows. Many 'Navvies' have laid by money, and not an inconsiderable number have raised themselves to be sub-contractors, though among them, as among every other class, the prudent are in the minority; they are rude and boisterous, not depraved; they buffet each other lustily in their cups; they take pleasure in making supercilious boors, and townsmen stand in awe of their rude strength; and they are jealous of the interference of the police."

These are the kind of men by which the laborious part of the railway work is executed; and it is calculated that for some years to come more than 200,000 men of this description will be required. Country justices do not know how to manage such rough customers, and call them ruffians and reprobates; but the large railway contractors find it easy to keep them in order, and win their respect. The mere Excavator can earn his three-and-sixpence a-day, while the agricultural labourer can scarcely make his eighteen-pence: his occupation is as healthy and invigorating as that of an agriculturalist, and he earns as much as the in-door

mechanic. Here, then, are elements for the philanthropist to work upon; and, by proper instruction, raise them to the level to which they would become entitled. Already much has been done in this way, but still much remains to be done; but, even in their present condition, they are very far superior to the mere labourer in agriculture.

And here we must not omit to notice the indefatigable exertions of Mr. Peto, the great railway contractor, who has endeavoured, by every means in his power, to improve the condition of the railway labourer. Schools have been established, circulating libraries formed, and the christian missionary has not thought his time misapplied in the task of instilling the truths of religion into the minds of this hitherto neglected portion of our population.

HOW TO CARRY OUT A RAILWAY.

Laborious and costly in its execution as the construction of a Railway is, the preliminary trouble, before the first sod is turned, is no trifling task. Leaving out of the question the mere bubble schemes, projected for the purpose of a gambling speculation, we will consider what has to be effected before a Railway can be fairly commenced.

These undertakings generally begin with a few individuals interested in the line of Railway proposed, when the project is honestly intended. But the great mass of original proprietors, even in the fairest scheme, are men of an adventurous and speculative turn of mind, who enter into these concerns for the mere purpose of making money. If the thing succeeds, and the shares rise to a large premium, as they often do, the original holders realize the profits at once, by selling out, and then apply their surplus capital to other projects with the same hope of gain. These people by going

out make way for another class of proprietors, namely, those who look to their shares as a permanent investment.

In the early stages of a Railway Company, the directors are generally self-elected, and these, to be of any service to the company, ought to be men of great local interest, not simply men of title or of wealth—men, in fact, of business-like habits and conciliatory dispositions, and capable of reasoning down the opposition of the landed proprietors through whose property the line is intended to run.

The secretary is a very important personage; he should be able to endure much hard work in travelling; be possessed of much general information; be somewhat of an engineer; and he would be better fitted for his situation also if he were a draughtsman. Next comes the engineer, and, of course, he can be best judged by the works he has already executed.

When the Railway is decided on, and these officers appointed, the first thing to be done is to ascertain the traffic between the two places intended to be connected with each other. This is a task that requires great care and attention. A man must be stationed by day, and

another by night, for two or three weeks, to count all vehicles passing a given number of spots along the intended line, (these spots should be near the principal towns,) leaving out the largest terminus, as, for instance, London, and keeping the men on that side of the respective towns which is nearest the largest terminus. The number of passengers should also be noted, and the cause of any increase or decrease on particular days. The information thus obtained is entered in a book, methodically arranged, and from this book the expected traffic is calculated.

In the meantime the surveyor or engineer has been busy taking the levels of the country, boring to discover the nature of the strata he may have to cut through, and preparing a rough sketch of the ground. The engineer generally has two or three lines roughly surveyed, and from these that which seems best adapted for his purpose is selected.

Matters being thus far proceeded with, an act of incorporation must be obtained from Parliament; and now the parliamentary agent is called in to see that the rules of the House are properly attended to. We suppose the bill

has escaped clear through this ordeal, and a fiery ordeal it is, and ought to purify whatever is subjected to it, it is now turned out in the form of a sterling respectable Act of Parliament, the directors have full powers, and this the holders of scrip soon discover, when the respective calls are made upon them.

The engineer has by this time made his estimates; so much for tunnelling, so much for embankments, for bridges, viaducts, &c. The principal works are done by contract. One man, for instance, will contract to form the entire line, buying the land and delivering the Railroad complete to the company; or one man may undertake an embankment; another a tunnel. These will be let out in smaller portions to sub-contractors, who, perhaps, again do the same. Thus the work proceeds until at length bridges, tunnels, viaducts, stations, termini, are all complete, and the whole staff of the company is filled up, clerks appointed, a police regulated, the locomotive placed on its destined rail, the carriages linked to the engine, and to each other, the steam up, whizzing and snorting like an eager steed, *the bell rings,* the whistle gives the signal

EMBANKMENT.

for departure, and off they go. The Railroad is now open; and the vast amount of money that has been buried in it, begins slowly to return into the pockets of the shareholders.

In order, however, that all these operations may be carried on without danger, signals have been arranged, which, although they may appear strange and complicated to the passing traveller—confused, perhaps, by the rushing of the engine, the shriek of the whistle, the waving of flags, and the flashing of many coloured lamps—are, nevertheless, so simple that a mere child can understand them.

The following are the regulations and signals employed on the London and North Western Railway:—

By Night—The *white light* denotes that all is right; the *green light* that a necessity exists to proceed cautiously; the *red light*, always, to stop.

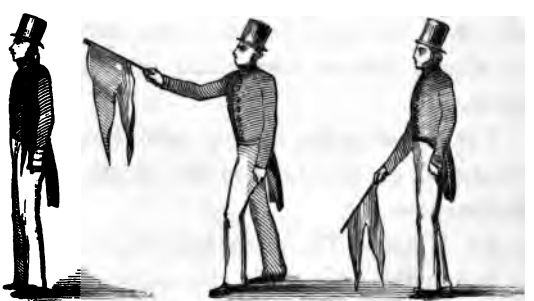
By Day—Flags, or boards, of the same colour, are used instead of lamps.

The whistle, whether by night or day, denotes the approach of a train.

A second lower tail lamp, or a red board

attached to the end of a train, denotes that a special train is about to follow.

POLICE SIGNALS—"In order," say the standing orders of the Railway just mentioned, "to simplify the signals shown by the police, and to make them as clear and distinct as possible to the engine drivers, guards, and others, the following positions of the men and the use of the flags will be observed—



1 2 3

"When the line is clear, and nothing to impede the progress of an engine, the policemen on duty will stand erect with his flag in his *hand, but sh*owing no signal (fig. 1).

" If it be required that the engine should slacken speed, and proceed with caution from another engine having passed on the line within five minutes, the green flag will be shown elevated as in fig. 2.

" If it be required that the engine should slacken speed, and proceed with caution on account of any defect in the rails, the green flag will be depressed, as in fig. 3.

" If it be required that the engine should stop altogether at any given point, the red flag will be shown, and waved backwards and forwards by the policeman facing the coming engine: the engine drivers will, therefore, invariably stop on coming to a red signal. Any signal, however, either by day or night violently waved denotes danger and a necessity for stopping."

On the Midland, Eastern Counties, Norfolk, and several other Railways, the patent " Semaphore " is used. It consists of a tall white post, so placed as to be visible at a considerable distance. At the top are two moveable arms which fold into a case; and on each side, lamps which turn on upright axles, and can be *made to* show a white, green, or red light.

4 5 6

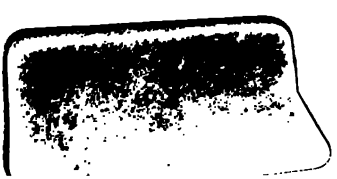
When the line is clear, the arm is left in its case, giving the same signal as a white light, and is unseen, as in fig. 4; if half raised, as in fig. 5, it corresponds to a green light, and indicates caution; if raised to a right angle, as in fig. 6, it, like a red light, warns the driver to stop. The right hand arm gives signals for the right line of rails, and *vice versa.*

For the comfort of nervous travellers, it may be as well to say that a red light or flag does not always denote *danger.* If a train is required to stop at any place, the red signal is shown; and at stations the red "Semaphore" arm is kept up five minutes after a train has *passed; then* half lowered five minutes more; *then shut up.*

During a fog extra precautions are necessarily employed: for instance, the whistle is frequently blown, and detonating balls of considerable size, and making a loud report, are laid upon the rail at some distance from any serious obstacle, the wheel of the approaching engine causing them to explode as it passes over them.

Such are a few only of the precautionary measures and regulations of a Railway; but these are sufficient to enable the reader to understand to what extent his safety has been studied by the managers of these giant establishments.

We have already noticed how small the proportion of accidents is to the number of passengers carried, and the number of miles travelled by rail, but this degree of increased safety, when compared with the number of accidents that formerly occurred when the fast coaches were on the road, has only been obtained by constant attention and care: the Government itself has appointed an engineer to survey and report upon the safety of the line before it is allowed to be opened to the *public*. A code of signals has also been ar-

ranged, which we explained in another page, and great attention is paid to the means by which the engine can cross, or be placed on, another line of rails without danger. This is effected by means of a bar of iron, called a switch, moving upon a hinge upon one side of the line of rails, and capable of being laid either into the main line, or line of sidings. These switches are moved in various ways, and are attended by a set of men called *switchmen*, or at times *pointmen*, who, by means of a lever and some other mechanical contrivance, move the switch whenever necessary.

The rail is also constantly looked after by the *platelayers*, who examine the rails morning and night, and guage its width, to ascertain it has not been disturbed by the passage of the train; and, if any damage has been done, see to its repair in due time. Over these men is placed the *ganger*, or foreman, who is responsible for the acts of those under him.